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# Clinical Guideline

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## Replacement of low vitamin D level in patients with low / normal calcium level and eGFR >30 mL

**Summary:** Guidance on the management of severe Vitamin D deficiency in patients, and guidance on whom to measure Vitamin D levels in. It provides clear instruction on the usage of high dose colecalciferol, in addition to standard maintenance calcium & vitamin D supplements. This guidance is not suitable for patients with eGFR less than 30mL.

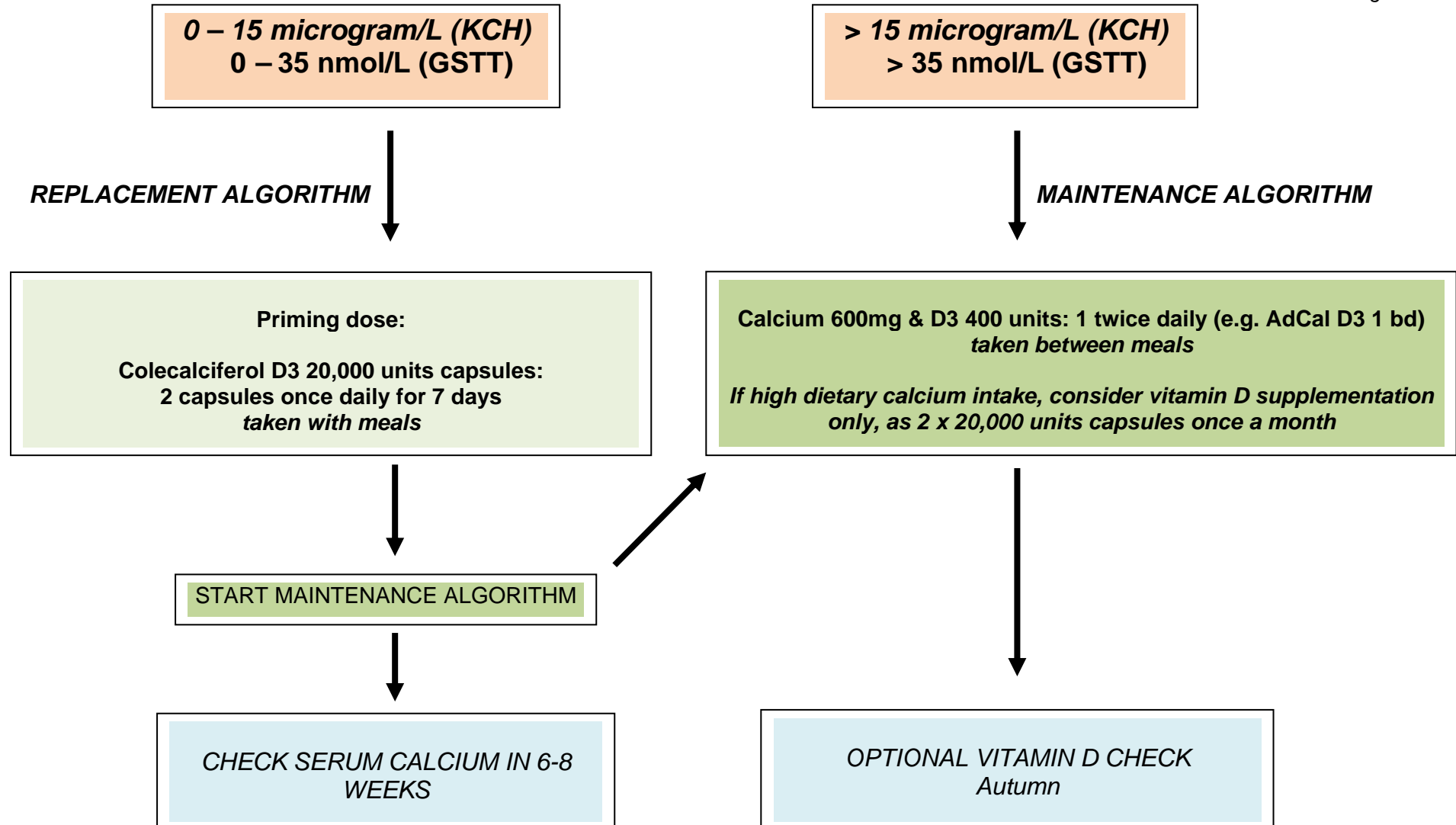
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## Replacement of low vitamin D level in patients with low / normal calcium level and eGFR >30 mL

GSTT/KCH shared guideline; Departments of Ageing & Health, Clinical Chemistry, Rheumatology, Pharmacy.

*GSTT laboratory reports in nmol/L*  
*KCH laboratory reports in microgram/L*  
*2.5 x microgram/L = nmol/L*



## Replacement of low vitamin D level in patients with low / normal calcium level and eGFR >30 mL

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GSTT laboratory reports in nmol/L  
KCH laboratory reports in microgram/L

*Contraindicated* – eGFR<30mL, history of Ca<sup>++</sup>-containing renal stones, hypercalcemia. *Caution* – Sarcoidosis

Bone health is optimal when serum levels of Vitamin D are above 30 microgram/L (75 nmol/L) i.e. PTH is optimally suppressed. However consensus on how to achieve optimal serum Vitamin D level is unclear (seasonal variation, other fracture risk factors etc.)

Colecalciferol (D3) is more effective than Ergocalciferol (D2)

There is no toxicity until > 100 microgram/L or 250 nmol/L

### INDICATION TO CHECK LEVELS AND TO REPLACE SERUM 25(OH) VITAMIN D (25OHD)

- Fragility fracture despite adequate treatment (including Vit D/Ca<sup>++</sup> supplements)
- Fragility fracture at young age (<60 yrs) / Starting iv Bisphosphonate / Teriparatide / PTH
- Malabsorption (coeliac, small bowel resection etc.)
- On bone modifying drugs: steroids, Antiepileptic, Antiaromatase, Antiretrovirals
- Risk of osteoporosis: Inflammatory disease: RA; COPD, SCA, Immobilization, liver or kidney disease

### ENSURE SERUM (CORRECTED) CALCIUM AVAILABLE (2.15-2.55mmol/L)

- If >2.7 (repeat sample) check PTH & 24-hr urinary Ca<sup>++</sup>, stop Ca<sup>++</sup> supp's, refer to Endocrine/Bone clinic
- If low calcium, check Vitamin D; consider referral to Bone clinic

### BONE BIOCHEMISTRY ASSESSMENT

- *Bone profile (calcium, phosphate, albumin, Alk Phos)* – yellow top serum tube
- *25OHD* – yellow top serum tube
- *PTH (send only if hypercalcemic)* – Red tube, deliver straight to laboratory
- *Urinary Ca<sup>++</sup>/Creatinine ratio (only if high PTH or renal stones)*; morning sample
- *24hr urinary calcium (only if high PTH or renal stones)*
- Bone turnover markers *CTX, P1NP (osteoporosis clinic only)* yellow serum tube

### ERGOCALCIFEROL (VITAMIN D2)

Plant source, whereas D3 is animal source (if patient requests)

Less certain bioactivity than D3, so double doses needed

### INTRA-MUSCULAR VITAMIN D2

Unpredictable and slow systemic uptake

Only recommended in patients with extensive small bowel resection.

Maintenance: 300,000 units 6-monthly

Diet is a poor source of Vitamin D  
10 minutes of midday Summer sun generates  
3,000 units vitamin D (without sun block).

#### Dietary calcium

Consider deficient if low intake of dairy products, fish.  
See link for leaflet on high Ca<sup>++</sup> foods (pages 16,17).  
[www.nos.org.uk/NetCommunity/Document.doc?id=395](http://www.nos.org.uk/NetCommunity/Document.doc?id=395)

Ca/Vit D supplements – one bd preferable to 2  
together as calcium absorption reaches peak, and  
impaired by a number of foods, so *take 2 hours  
before/after meals.*

Vitamin D alone – absorption aided by fat in diet – *take  
with meals*

### NON-COMPLIANCE WITH ORAL MAINTENANCE D3

Combined Vit D/Ca<sup>++</sup> supplements preferable as patient likely to also have a Calcium-deficient diet

Review reason for non-compliance and review the need for maintenance;

- Try soluble Ca/vit D preparation (e.g. *CacitD3* or *AdcalD3 Soluble*)
- Or consider 40,000 units/month oral colecalciferol
- Or consider Intra-muscular Vitamin D2 (ergocalciferol)

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Adapted from Oxford Metabolic Bone Disease Unit Vitamin D guidance, Dr MK Javaid.

## Replacement of low vitamin D level in patients with low / normal calcium level and eGFR >30 mL

GSTT/KCH shared guideline; Departments of Ageing & Health, Clinical Biochemistry, Nuclear Medicine, Pharmacy.

This guidance is to address:

- Those with severe vitamin D deficiency
- Those who require Vitamin D supplementation, but who have high dietary calcium intake already
- Those who do not adhere to daily supplementation of Ca/Vit D supplements.

Vitamin D deficiency is very common though recommended serum vitamin D levels are not established. However it is increasingly recognised that higher serum levels of at least 60nmol/L are associated with optimal bone health<sup>1</sup>. In treating osteoporosis, vitamin D and calcium supplementation is recommended in all cases, unless replete as per serum levels. Replacement of vitamin D is usually in combination with calcium supplements; the combined calcium/vitamin D supplements contain 400 units of vitamin D per capsule, i.e. 800 units a day, which is often insufficient in bringing low levels to an optimal range<sup>1</sup>. In addition, many patients (frail older patients in particular) have poor adherence with these daily supplements, finding them unpalatable. Consequently, poor adherence may compromise the benefits of anti-resorptive treatments for osteoporosis<sup>2</sup>. Also, there is often reluctance to supplement those who already have high dietary calcium intake due to potential renal and cardiovascular risk<sup>3</sup>. High-dose oral vitamin D loading has shown to be safe and effective<sup>4,5</sup>. Colecalciferol (D3) is superior to Ergocalciferol (D2) in achieving optimal serum levels<sup>6</sup>.

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2. Adami S, Giannini S, Bianchi G et al. Vitamin D status and response to treatment in post-menopausal osteoporosis. *Osteoporos Int.* 2009;20:239-44.
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4. Bacon CJ, Gamble GD, Horne AM et al. High-dose oral vitamin D3 supplementation in the elderly. *Osteoporos Int* 2009;20:1407-15.
5. Leventis P, Kiely PD. The tolerability and biochemical effects of high-dose bolus vitamin D2 and D3 supplementation in patients with vitamin D insufficiency. *Scand J Rheumatol.* 2009;38:149-53.
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